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APPLICATION FOR LETTERS PATENT

TITLE: STATISTICAL MULTIPLEX SYSTEM, STATISTICAL MULTIPLEX CONTROLLER AND METHOD OF STATISTICAL MULTIPLEX

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STATISTICAL MULTIPLEX SYSTEM, STATISTICAL MULTIPLEX CONTROLLER AND METHOD OF STATISTICAL MULTIPLEX

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a statistical multiplex system for encoding and multiplexing a plurality of program data which includes image data and auxiliary data other than the program data, and a statistical multiplex controller and a method of statistical multiplex that are used in the statistical multiplex system.

2. Description of the Related Art

Recently, digital broadcast for transmitting and receiving image data and the like as digital data has been attracted attention. It is an advantage of the digital broadcast that more program data (hereinafter, referred to as program) can be transmitted as compared with analog broadcast in the case that the same transmission channel is used. The reason for this greatly depends on a fact that image data can be transmitted with compression. As a method for compressing image data, for example, a bidirectional predictive encoding method that is adopted in an MPEG (Moving Picture Experts Group) standard has been employed.

When compressively encoding images for the digital broadcast, high image quality must be maintained while an amount of compressively

encoded data (a quantity of bits) is suppressed to at most a transmission capacity of the transmission channel.

A technique called "statistical multiplexing" may be employed to transmit more programs to a transmission channel having a predetermined transmission capacity. The statistical multiplexing technique is a technique in which a code rate to be assigned to each program is dynamically changed so as to transmit more programs. In the statistical multiplexing technique, for example, by means of reducing the code rate with respect to the program in which deterioration of image quality is not noticeable even if the code rate thereof is reduced, it becomes possible to transmit more programs.

Referring to Figs. 1 and 2, the statistical multiplexing control will be further described. Fig. 1 shows an example of assigned code rates to respective programs when the programs are multiplexed by conventional fixed rates. In Fig. 1, the vertical axis indicates the assigned code rates to the respective programs, while the horizontal axis indicates time. As shown in Fig. 1, the assigned code rates to the respective programs, such as a weather forecast, news and drama, which are to be multiplexed, are kept at code rates assigned as initial values, which have not been changed in accordance with time passing. The code rates which are assigned to the respective programs as the initial values are assigned so that deteriorations of image quality in portions (time) of the respective programs whose deteriorations of image quality are conspicuous are within allowable ranges. As a result, excessively high code rates are assigned to

portions except for the potions in which the deteriorations of image quality are conspicuous.

Fig. 2 shows an example of assigned code rates to respective programs when the code rates assigned to the respective programs are dynamically changed and multiplexed by using the statistical multiplexing technique. The vertical axis indicates code rates assigned to the respective programs, while the horizontal axis indicates time. The statistical multiplexing technique uses the fact that portions (time) of the respective programs whose deteriorations of image quality are conspicuous unusually occur simultaneously. Since there are many cases where portions of a program whose deteriorations of image quality are conspicuous correspond to portions of the other programs whose deterioration of image quality is inconspicuous even if the code rates thereof are reduced, a great code rate can be assigned to the program whose deterioration of image quality is conspicuous by reducing the code rates of the other programs. In an example shown in Fig. 2, when a portion of drama (1) is conspicuous in deterioration of image quality and portions of news and drama (2) are inconspicuous in deterioration of image quality at time P, the code rates of the news and the drama (2) are reduced so as to assign the drama (1) additionally with the code rate corresponding to the code rates. Thus, employment of the statistical multiplexing technique enables a larger number of programs than usual to be transmitted.

Here, in recent years, it is considered to transmit auxiliary data other than programs, including an EPG (Electric Program Guide), together